Technical Report Series

NIPIGON RIVER: DEVELOPMENT OF A WATER MANAGEMENT PLAN

PREFERRED OPTION REPORT

TECHNICAL REPORT No. 20

September, 1994

NORTH SHORE
OF LAKE SUPERIOR
REMEDIAL ACTION PLANS

NIPIGON RIVER: DEVELOPMENT OF A WATER MANAGEMENT PLAN

FINAL REPORT

Prepared for:

Nipigon River Management Committee

Prepared by the Study Team:

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September, 1994

ACKNOWLEDGEMENTS

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Note: Other stakeholders were invited to participate.

Thanks to all who took the time to provide information and comments.

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1.0 INTRODUCTION

Chapter 1.0 presents an outline of the background to the study, the scope of the work, this report and the modelling procedures.

1.1 BACKGROUND

This report is the third and final in a series of reports which document the development of a water management plan for the Nipigon River system (see Figure 1.1). This project was initiated by the Nipigon River Management Committee, which includes representatives from the Ontario Ministries of Natural Resources and Environment and Energy, Ontario Hydro, the Nipigon Bay Remedial Action Plan team, the Nipigon Bay Remedial Action Plan Public Advisory Committee, Environment Canada and Fisheries and Oceans Canada. The Nipigon River Management Committee was formed in 1990 in response to increased demands being placed on the Nipigon River watershed.

The study was conducted over a two-year period by the Study Team headed by Atria Engineering Hydraulics Inc. (Atria). Atria was assisted by David Evans, community affairs consultant, Ecological Services for Planning Limited (ESP), Alan A. Smith Inc. (AAS), E. Soulis, K. Ponnambalam, and MWR and Associates.

The first report, *Nipigon River - Development of a Water Management Plan, Draft Options Report* (Atria, 1993), was released to the public in May, 1993. It marked the half-way point in the study. The report summarized issues identified by individuals and groups, interviewed by members of the Study Team, who had concerns about the effects of water level fluctuations on the Nipigon system. The Study Team found that generally stakeholder positions fell into one or more of seven categories:

1) those concerned with brook trout and other fish in the lower Nipigon River;

2) those concerned with fish species in Lake Nipigon - namely whitefish, walleye, lake trout and brook trout;

3) those concerned with maximizing the production of hydro-electric power;

4) shoreline property owners and users along the Nipigon River including Lake Helen and Polly Lake;

5) shoreline property owners and users on Lake Nipigon;

6) boaters on Lake Nipigon and Lake Helen; and

7) those concerned with the Town of Nipigon and the Red Rock Indian Band water supply.

Figure 1.1 Study Area

The *Draft Options Report* also identified some conceptual management options to address stakeholder concerns and solicited public input to each of them. The report was discussed at public meetings held in Nipigon, Thunder Bay and Beardmore in June, 1993. A list of errata for the *Draft Options Report* is presented after the appendices at the end of this report.

Following the June, 1993, public meetings, a multi-stakeholder, community-based Working Group was established to assist the Study Team in developing a preferred option for managing water quantities in the Lake Nipigon/Nipigon River system. The Working Group met eight times over the last year. The Working Group is discussed further in Section 2.3.

The second report, *Nipigon River - Development of a Water Management Plan, Options Report* (Atria 1994), was released in April, 1994. The *Options Report* outlined the continuing public consultation process including the community-based Working Group. The report described how the interests of the various stakeholders were taken into consideration through the use of penalty functions and weighting factors. A range of options for managing the water quantity in the Nipigon system was presented. The multi-objective optimization computer model which was used to develop the options was described. The results of the simulation of the performance of the options were provided. Comparisons of the results with historically observed data were presented. A list of errata for the *Options Report* is presented after the appendices at the end of this report.

This, the *Final Report*, documents the results of the consultation following the release of the *Options Report* and the selection, by the Study Team, of the preferred option for the management of water levels and flows in Lake Nipigon and the lower Nipigon River.

1.2 SCOPE OF STUDY

The overall goal of the study was to establish, through public involvement, a management option that would reduce the impacts of the operation of Ontario Hydro's Nipigon River hydro-electric dams on the Lake Nipigon/Nipigon River watershed, particularly on the Nipigon River fishery. This management option for the Nipigon River must not further aggravate the impacts of fluctuating water levels on Lake Nipigon.

It was recognized in the *Draft Options Report* that other factors, other than fluctuating water levels, influence the health of the fisheries in the Nipigon River and Lake Nipigon. However, as outlined in the stated goal and in the study *Terms of Reference*, this study was limited to the development of a water quantity management plan for levels and flows in the Lake Nipigon/Nipigon River system. According to the *Terms of Reference*, the study did not include consideration of altering the inflow of the Ogoki diversion to Lake Nipigon.

Readers are directed to the *Draft Options Report* for details of the study approach and process.

1.3 THIS REPORT

Following the release of the *Options Report*, the Study Team solicited comments and opinions from the stakeholders regarding the presented options and the expected advantages and disadvantages of each option. The community-based Working Group, which had representatives from local stakeholder interests, assisted the Study Team in reviewing and evaluating the merits of the options. Other stakeholders also reviewed the options to assess how the options performed with respect to their interests.

The objective of this final phase of the study was to develop a preferred water quantity management option. The Study Team worked towards building a consensus amongst the stakeholders on a preferred option.

This, the *Final Report*, presents to the Nipigon River Management Committee the Study Team's recommendation for the preferred option for management of water quantity in Lake Nipigon and the Nipigon River. Other recommendations regarding procedures to implement the option, mechanisms for monitoring and updating the plan and future work are also presented.

1.4 NEXT STEPS

The Study Team's recommendations are based on the results of a public process, as well as our professional judgement. They are not binding. With the submission of the *Final Report*, the mandate of the Study Team came to an end.

The Nipigon River Management Committee reviewed this document and has endorsed the selection of Option V by the Working Group and Study Team as the preferred water management strategy for the Nipigon River system. The Committee has some concerns over specific Study Team recommendations, but agreed that these recommendations should be considered during discussions on reaching a long-term water management strategy for the Nipigon River system.

1.5 SUMMARY OF MODELLING PROCEDURE

The preferred option for managing the water levels of Lake Nipigon and the flows in the Nipigon River was developed using a multi-objective optimization computer model. The computer model provided a way to quantify the competing interests so that an optimal or preferred operating option, which represents a reasonable compromise to all the stakeholders, could be identified.

The modelling involved the use of penalty functions and weighting factors, the optimization of strategies and the simulation of levels and flows using historical data. The modelling procedure has been described in detail in the *Options Report*. A summary of the procedure is provided in the following subsections.

Penalty Functions

Penalty functions were used to represent the water levels or river flows that each stakeholder wants during different times of the year. Included in the penalty functions are the "desired" or "target" levels and/or flows for that particular stakeholder. The penalty functions were used as an indicator of the performance of the options. Details of the penalty functions are provided in the *Options Report*. The functions are reasonable representations of the interests of the various stakeholders and are based on the best available data gathered by the Study Team through their investigations, during interviews with the stakeholders and at Working Group and public meetings. The *Draft Options Report* (Atria, 1993) contains much of this information. The penalty functions can be updated as more or improved data becomes available.

The penalty functions used in this study are not absolute indicators of cost in dollars. The word "cost" is defined as "involving the payment or sacrifice or loss of". Cost is not limited to measurement by dollars. The Study Team recognizes that the costs indicated in the penalty functions are subjective measures. Nevertheless, they provide a common basis for comparison, since dollars cannot compare directly with such concerns as declining native fish species, ecosystem degradation and loss of use and enjoyment. The value of the "costs" in the penalty functions possibly could be improved with more data and more sophisticated measures and studies in an attempt to achieve something close to an absolute indicator. However, using an absolute indicator is only a dream because everybody has different value systems. The penalty functions reflect each stakeholder's own value system and provide a "platform" for conversation between the stakeholders. Hence, assignment of the cost value by a stakeholder, using a penalty function, does not affect other's subjective values. The relative change in the penalty value only indicates if the option makes the stakeholder's situation improved or not.

Weighting Factors

After the stakeholder penalty functions were established, the next step in the modelling procedure was to assign "weighting factors" to the penalty functions. Remember that the penalty functions represent what each of the various stakeholders wants in terms of water levels and flows. **The weighting factors reflect the relative importance of each of the stakeholders with respect to the other stakeholders.** The relative importance, or weight, of each of the stakeholder penalty functions is based on considerations of environmental impact, economic impact and distribution of impacts. Some improvements and damages can be quantified in dollars while others, particularly those related to environmental impacts, can not. As with any assessment, there will be some uncertainties in measurement techniques and reliability of data and some value judgements have to be made.

Optimization

Once an option had been identified, the next step was to develop an optimal strategy or plan for releasing water from Lake Nipigon to the Nipigon River for that specific option. The multi-objective optimization computer model determined the optimal operating strategy that minimized the total

penalty, or cost, to all of the stakeholders (based on the assigned weighting factors) as a group. The penalty functions are measures of the costs incurred by the different stakeholders for a range of water levels and flows. Minimizing the total penalty does not mean that each stakeholder's cost is necessarily minimized. In fact, one or more stakeholders may not see their costs minimized. However, for a given set of penalty functions and weighting factors (i.e, for a specific "option"), the strategy computed by the optimization model is the optimal strategy for that given set of penalty functions and weighting factors.

The optimization computer model used in this study is referred to as a "stochastic dynamic programming" model and was discussed in the *Options Report*. The model works on a weekly timestep and determines weekly average flow (i.e. daily average flow, constant for a week).

The model is representative of the Nipigon system for planning purposes. The model is based on the flow continuity equation and it considers "supply risk". The term "stochastic" means risk of net basin supply. Net basin supply is the sum of all water inputs to the Nipigon watershed including the Ogoki diversion. Using 36 years of historical data (1951 to 1986), the model not only determined the probability of basin supply for each week but also the transitional probability of the supply (i.e., the probability of having a specified supply in the next week given that the current supply this week is known). Thus the model does indeed consider the future supply risk.

Simulation of Levels and Flows

Once an optimal operating strategy for each option had been obtained, the historically observed net basin supply data from 1951 to 1986 were used to simulate, for each option, the average weekly level of Lake Nipigon and the average weekly flows in the Nipigon River. The 1951 to 1986 period reflects conditions after construction of last generating station (Pine Portage) in 1950. The latest net basin supply data available was 1986.

The simulated time series of weekly average lake levels and the minimum and maximum river flows were then used to compare what potentially happened between 1951 and 1986 (i.e., the observed data with the specified minimum flow restrictions) and what would have happened over the same time period if the simulated option had been in place.

2.0 PUBLIC AND STAKEHOLDER CONSULTATION

Chapter 2.0 outlines the public consultation activities that have taken place over the past two years including the community-based Working Group and their recommendations.

2.1 EARLIER PUBLIC CONSULTATION ACTIVITIES

The *Draft Options Report* and the *Options Report* outline the public consultation effort that had been undertaken during the two years of the study prior to the release of the *Final Report* including:

- personal interviews;
- meetings with stakeholder groups;
- June, 1993, public meetings in Nipigon, Thunder Bay and Beardmore;
- January, 1994, informal open house in Nipigon;
- meetings of the community-based Nipigon River Water Quantity Management Working Group;
- meetings/discussions/presentations with major stakeholder groups such as the Joint Problem-Solving Team, Rocky Bay First Nation/Ontario Hydro Past Grievances Process and representatives of several First Nations, the Rocky Bay Fisheries Unit, Ontario Hydro and Ministry of Natural Resources;
- mailings of four "Update" newsletters (which resulted in written comments to the Study Team);
- distribution of approximately 100 copies of the *Draft Options Report* and 50 copies of the *Options Report*;
- press releases; and
- articles in local newspapers and interviews on local radio and television stations.

During the second year of the study, the major part of the public consultation effort concentrated on the Working Group. The Working Group is discussed in Section 2.3.

2.2 FURTHER CONSULTATION ACTIVITIES

The final version of the *Options Report* was released in April, 1994. Copies of the report were sent to members of the Nipigon River Management Committee and the Working Group. Copies were also sent to other people who had previously expressed an interest in receiving the full report. A preliminary draft version of the *Options Report* (December, 1993) and a final draft version (March, 1993) previously had been circulated and presented to the Nipigon River Management Committee, the Working Group and other major stakeholder groups.

The forth "Update" newsletter (Volume 4, April, 1994) summarized the *Options Report* and was sent to all those on the Study Team's mailing list. The newsletter asked people to submit comments to the Study Team within a period of approximately one month. A copy of the April, 1994, "Update" is provided in Appendix A. A summary of the written responses is provided in Appendix B. The comments are discussed in Section 2.4.

A press release was issued in May, 1994. It announced the release of the *Options Report*, outlined the nature of the study and noted the final meeting of the Working Group in June, 1994. A copy of the press release is provided in Appendix C. In the first week of June, prior to the final Working Group meeting, the Study Team project manager was interviewed by the Thunder Bay Times-News newspaper and on-air by CBC Radio in Thunder Bay. A member of the Nipigon River Management Committee was interviewed by CJLB radio in Thunder Bay.

The final Working Group meeting took place on June 9, 1994, in Nipigon. A reminder notice regarding the last meeting (see Appendix C) was sent to members of the Working Group at the end of April, 1994. The notice stated in part that "...it is anticipated that the Working Group will be in a position to decide on a preferred option for recommendation to the Study Team." The final meeting was advertised in two local papers. A copy of the advertisement is provided in Appendix C.

A meeting was held June 27, 1994, in Toronto, between some members of the Study Team and Ontario Hydro to discuss Hydro's response to the *Options Report*. Ontario Hydro did not provide a written response to the *Options Report*. Readers are reminded that Ontario Hydro is a member of the Nipigon River Management Committee which is the group that receives the *Final Report*, with the recommendations, from the Study Team.

The *Final Report* will be released to the community. All those on the Study Team's mailing list, which has grown to approximately 150 names, will receive a fifth "Update" newsletter providing a brief summary of this report. A complete copy of this *Final Report* will be sent to anyone who requests one. A public information session to present the final recommendation is being considered for Nipigon. People will be notified of this session.

2.3 WATER QUANTITY MANAGEMENT WORKING GROUP

The community-based Water Quantity Management Working Group was established to assist the Study Team in developing a preferred option for managing the water quantities in the Lake Nipigon/Nipigon River system. Invited membership to the Working Group included a broad spectrum of community members representing shoreline owners, tourism, recreation, boaters, municipal works, the general public, environmental protection, First Nations, anglers and hunters and commercial fishing interests. Also, membership includes participants from Lake Nipigon, Polly Lake, Lake Helen and along the Nipigon River. Terms of Reference for the Working Group were presented in the *Options Report*. Minutes of the meetings were kept and distributed to the Working Group and the Nipigon River Management Committee. Meetings of the Working Group were open to the public.

The Working Group did not include representation from Ontario Hydro and the Ministry of Natural Resources. The views of these two significant stakeholders were channelled through the Nipigon River Management Committee. Representatives from Ontario Hydro and the Ministry of Natural Resources did attend meetings of the Working Group as resource people at the request of the members.

A summary of earlier progress by the Working Group in the first seven meetings was provided in the *Options Report*. At the eighth and final meeting on June 9, 1994, the results of the public consultation were discussed. The options were further explained by the Study Team in response to questions raised by the members. The members present then reached a consensus regarding the preferred option which they recommended to the Study Team. The recommendations of the Working Group are discussed in Section 2.4.

2.4 RESULTS AND DISCUSSION OF PUBLIC CONSULTATION

First Year

Following the release of the *Draft Options Report* and the June, 1993, public meetings at the end of the first year of the study, the Study Team concluded that they had successfully identified all the users, their various interests and the conflicts between the interests. People did express opinions that the *Draft Options Report* placed too much emphasis on certain users or issues and not enough emphasis on some of the other issues. The Study Team felt that these views were often based on differences in the users' interests on Lake Nipigon and the lower Nipigon River. Nevertheless, there appeared to be a strong consensus that fish habitat and spawning and the overall environment are the most important considerations. Also, remarks were consistently made that the preferred solution would be a compromise. Generally people expressed an appreciation of other people's interests. They were hopeful that finally, all the interests were going to be considered fairly.

Second Year

With the knowledge gained from the personal interviews and the stakeholder and public meetings in the first year, and through the community-based Working Group and other stakeholder meetings in the second year of the study, the Study Team formed the following views of the community's opinions:

- A significant majority of people consulted by the Study Team held the view that the environment and the fisheries in the whole Nipigon system are the most important considerations in developing a water management plan.

- Many of those consulted by the Study Team felt that there needs to be a strong recognition of the great natural resource value of Lake Nipigon that is not overshadowed by the awareness of the needs of the brook trout in the lower Nipigon River.

- Most people acknowledged that the proper choice will be a compromise between the

various stakeholders including the fisheries, hydro-electric power generation, shoreline owners and users, water users and boaters.

- The process of managing water levels and flows in Lake Nipigon and the Nipigon River must recognize the interests of all the stakeholders. The process must be more open to public and stakeholder input.

Responses to April, 1994, Newsletter

The April, 1994, "Update" newsletter (see Appendix A) summarized the options and asked that people send in their views and indicate their preferred option. The Study Team received fourteen written responses. Some checked off more than one option and one checked off all the options. Of the twelve who indicated a preferred option or options, ten noted that they would prefer or would be satisfied with Option V (OPT5). Options IV (OPT4) and VI (FISH) were chosen four times and three times respectively. Options I (RIVFISH), II (LAKEFISH) and VII (HYDFISH) were each chosen twice. A summary of the responses to the April, 1994, newsletter are provided in Appendix B including people's written comments on the options and the study. The responses to the April newsletter provides a broader based support for the preferred option.

Working Group's Preferred Option and Other Recommendations

At the final meeting of the Working Group, on June 9, 1994, in Nipigon, the Study Team presented a summary of the *Options Report* and the comments received as a result of the April, 1994, newsletter. There was a discussion of the options and the Working Group reached a consensus regarding the preferred option.

The Working Group made the following recommendations:

- Option V (OPT5) should be the preferred option;
- implementation of the preferred option and future management of the Nipigon system should have stakeholder input and should be dynamic to permit means for improvement as more data becomes available;
- information on present and expected water levels and flows should be available on an on-going basis; and
- the Ogoki diversion should be considered in future water management studies.

Members of the Working Group also commented on the report and other matters. Members pointed out that the "comparison of the options" graph (reference Figure 4.5, *Options Report*) could be somewhat misleading to those who had not followed the study. For example, the graph showed a 44 percent improvement in water level conditions for Lake Nipigon shore owners and users.

However, if one looked at the number of weeks when the average weekly level was above the desired range of 259.4 m to 260.0 m (851.0' to 853.0') from May to November, it only decreased from 503 weeks to 416 weeks. If one further considers that typically, the Lake does not reach its peak until after June and then starts to drop, it is likely that most of the higher water times will occur during the months of July, August and September. In fact, in the *Draft Options Report*, it was reported that historically, 64 percent of the time in July and August, the water level had been higher than 260.0 m (853.0'). From a Lake Nipigon cottager's perspective, if there were only 468 available weeks in July, August and September, from 1951 to 1986, then having up to 416 weeks with levels higher than desired is not a cottager's preferred choice. However, members of the Working Group recognized that the overall preferred option must be a compromise and that the fish had been given a higher priority. They conceded that Option V does improve the cottager's situation (at least in the severity of the water levels which are higher than desired).

A member also pointed out that people should be clear that the higher weighting of the lake interests in Option V (OPT5) provides a greater degree of protection to the lake fish and lesser protection for the river fish than Option IV (OPT4) at times of low water inflow (i.e., very dry years).

Comments From Other Stakeholders

The Rocky Bay Fisheries Unit reviewed the *Options Report* and submitted a written response. The full text of the letter is presented in Appendix D. In part, the Rocky Bay Fisheries Unit stated:

> "After reviewing the document, and realizing that everyone must compromise to some extent, we recommend that, **until the studies being undertaken by the Rocky Bay fisheries Unit are completed and analyzed**, that OPTION 5 by adapted [sic] as an interim measure."

3.0 PREFERRED OPTION

Chapter 3.0 presents the recommended preferred option along with a description of the option and the changes that could be expected in the river flows and lake levels as a result of implementing the preferred option. In addition this Chapter provides a discussion of the rationale for changing the water management plan and why the preferred option was selected.

3.1 RECOMMENDATION

Option V (OPT5) is the preferred option. The Study Team recommends that Option V be adopted as the basis for developing a detailed operational plan for the management of water levels and flows in Lake Nipigon and the Nipigon River.

The Study Team's recommendations are based on the results of a public process, as well as our professional judgement.

3.2 DESCRIPTION OF PREFERRED OPTION

3.2.1 Outline of Preferred Option

When deciding how to manage the available water which flows into the Nipigon watershed, Option V (OPT5) says that 60 percent of the weight or emphasis should be placed on the water level requirements of the fish in Lake Nipigon. The river level requirements of brook trout and other fish species in the lower Nipigon River (below Alexander Generating Station) are given a weighting factor of 25 percent and the river flow requirements of hydro-electric power generation is assigned a weighting factor of 10 percent. The remaining 5 percent is split equally (2.5 percent each) between the desired water levels for shore owners and users on Lake Nipigon and for shore owners and users on the lower Nipigon River (which includes Lake Helen/Polly Lake). The other stakeholders are not given any explicit consideration. The minimum flow is restricted, when possible, to 270 m^3/s or greater from October to May and 170 m^3/s or greater for the remainder of the year.

Penalty functions for both the Nipigon River brook trout and hydro-electric power generation try to maintain flows above certain levels. This tends to lower the lake level during times of below normal water supply. In order to counteract this, the preferred option provides greater consideration to the interests on Lake Nipigon (62.5 percent combined for fish and shore owners and users) than the interests on the Nipigon River (37.5 percent combined for brook trout, hydro and shore owners and users). Brook trout on the Nipigon River are given two and one-half times more consideration than hydro-electric power generation. The importance of shore owners and users is considered to relatively small compared to fish.

As discussed in Section 1.5, penalty functions were used to represent the water levels or river flows that each stakeholder wants during different times of the year. Option V (OPT5) considers the target level or flow desired by each stakeholder, according to the weighting factors outlined above, and determines the Lake Nipigon water level and Nipigon River flow that best suits everyone collectively throughout the year. **Clearly, because the preferred option attempts to balance the interests of the various stakeholders, the net result is that each stakeholder group will not always get all of what it wants (i.e., stakeholders will not always see levels or flows at their respective target values). In addition, stakeholders must appreciate that the natural supply of water to the Nipigon watershed is the greatest single factor in determining the water levels and average flows in Lake Nipigon and the Nipigon River and one over which none of the stakeholders have any control. There will still be times in the future, during abnormally wet and dry years, that will cause water levels and flows to be much higher and much lower respectively than the target values of some stakeholders.** The preferred option will alleviate to some degree the severity of the higher or lower levels and flows according to the weighting factors specified.

3.2.2 Detailed Description of Preferred Option - Target Flows and Levels

A description of the stakeholders' target levels and flows and the minimum flow restriction is provided in the following paragraphs. A summary description of the target levels and flows and the weighting factors for Option V (OPT5) is provided in Table 3.1.

Lake Nipigon Fish

Lake Nipigon fish have been assigned a weighting factor of 60 percent.

The target water levels for Lake Nipigon fish are representative of the magnitude and timing of the estimated natural fluctuations of the lake (above and below an overall average level that is higher than the natural average level, prior to the construction of the dams). Essentially this means trying to keep water levels slightly lower in the fall and slightly higher in the spring if possible. The specific targets are to try to maintain the average weekly level of Lake Nipigon as follows: between 259.85 m to 259.80 m (852.57' to 852.40') during the fall spawning in October and November; between 259.80 m to 259.49 m (852.40' to 851.39') from December to May; and above 259.49 m (851.39') and below 260.0 (853.06') from June to September.

Brook Trout and Other Fish Species in the Lower Nipigon River

Brook trout and other fish species in the lower Nipigon River have been assigned a weighting factor of 25 percent.

Table 3.1 Summary Description of Preferred Option (Option V, OPT5)

Stakeholder	Description and Target Flows/Levels	Weighting Factor
Lake Nipigon Fish	Lake Nipigon fish most important consideration. More closely mimic natural Lake Nipigon average fluctuations by trying to get levels between 259.85 m & 259.8 m (852.6' & 852.4') during October & November, between 259.8 m & 259.49 m (852.4' & 851.4') from December to May and between 259.49 m & 260.0 m (851.4' & 853') from June to September.	60%
Nipigon River Brook Trout	Nipigon river brook trout and other species given high consideration. Try to maintain River flows between 350 m^3/s & 400 m^3/s in October & November, above 270 m^3/s from December to September and between 270 m^3/s & 450 m^3/s from June to September.	25%
Hydro-electric Power Generation	Hydro-electric power generation given lower importance than Lake and River fish. Try to maintain maximum daily River flow at 390 m^3/s throughout the year.	10%
Lake Nipigon Shore Owners and Users	From May to November the target level is between 259.4 m (851.0') and 260.0 m (853.0').	2.5%
Lake Helen/Polly Lake/Nipigon River Shore Owners and Users	From May to November, preferred Nipigon River flows are 300 m^3/s (approximately equivalent to a level of ±184.0 m) to 450 m^3/s (approximately equivalent to a level of ±184.6 m).	2.5%
Lake Nipigon Boaters	Not assigned a weighting factor because of lower priority. Target levels are similar to shore owners and users.	0%
Lake Helen/Polly Lake/Nipigon River Boaters	Not assigned a weighting factor because of lower priority. Target levels are same as shore owners and users.	0%
Town of Nipigon/Red Rock Band Water Supply	Not assigned a weighting factor because of lower priority. Target levels of other Lake Helen stakeholders and minimum flow restriction of 270 m^3/s (October to May) and 170 m^3/s (June to September) adequately covers their interests.	0%

Note: The option includes maintaining a minimum flow, when possible, in the Nipigon River of 270 m^3/s or greater from October to May and 170 m^3/s or greater from June to September.

The brook trout require flows in the lower river to be greater than a certain minimum value such that their habitat is sufficiently submerged during the spawning, incubation and hatching period. This period extends from the beginning of October to the end of May. During the remainder of the year, the minimum flow can be decreased. The target flows for the Nipigon River brook trout are between 350 to 400 m^3/s in October and November, and greater than 270 m^3/s from December to the end of May. During the summer, from June to September, the target flow is between 270 and 450 m^3/s.

Hydro-electric Power Generation

Hydro-electric power generation has been assigned a weighting factor of 10 percent.

The amount of electric power generated depends on the flow. The target flow for Ontario Hydro is a maximum daily flow of 390 m^3/s throughout the year. Maximum flows occur during the peak electricity demand period of the day.

Lake Nipigon Shore Owners and Users

The interests of shoreline property owners and users on Lake Nipigon have been assigned a weighting factor of 2.5 percent.

The preferred range from May to November is estimated to be 259.4 m (851.0') to 260.0 m (853.0').

Lake Helen/Polly Lake and Lower Nipigon River Shore Owners and Users

The interests of shoreline property owners and users on Lake Helen, Polly Lake and the remainder of the lower Nipigon River have been assigned a weighting factor of 2.5 percent.

From May to November, the preferred range of flows for shoreline property owners and users on Polly Lake and Lake Helen is between 300 m^3/s (which is approximately equivalent to a level of ±184.0 m) to 450 m^3/s (approximately equivalent to a level of ±184.6 m). The preferred flow is about 375 m^3/s (level of ±184.3 m). These are approximate values and they are also dependent on the level of Lake Superior. No specific penalty has been defined for flows during the remainder of the year.

Other Stakeholders

Boaters on Lake Nipigon and the lower Nipigon River and the Town of Nipigon/Red Rock Indian Band water supply were not assigned a weighting factor in the preferred option. Nevertheless, boaters have similar water level targets as the shore owners and users. The water supply concerns are adequately covered by the flow requirements of the brook trout in the lower river.

Minimum Flow Requirements

The preferred option includes maintaining a minimum flow, when possible, in the Nipigon River of 270 m^3/s or greater from October to May and 170 m^3/s or greater from June to September. This is representative of the present interim flow agreement between the Ministry of Natural Resources and Ontario Hydro. Minimum flow restrictions limit how low the flows can be dropped during the periods of reduced electricity demand (i.e., the "off-peak" period from midnight to 7:00 a.m.). Increasing the flow from the minimum value at night to the maximum value during the day (to meet peak energy demands from 7:00 a.m. until midnight) is referred to as "peaking".

The minimum flow restriction does not mean that the flow can never go below the specified value. The minimum flow restriction was used to determine the peaking characteristics of the generating stations. Once the average flow was determined, the minimum flow restriction established the lower limit of peaking. If the average flow determined for a given week was less than the specified minimum flow restriction, no peaking of the flow was permitted for that week. If the average flow determined was higher than the minimum flow restriction, then peaking was permitted and the minimum flow allowed was the specified value. Knowing the minimum and the average flows for each week, one could then determine the maximum flow for that week. Further explanation of the minimum flow requirement can be found in Section 3.6 of the April, 1994, *Options Report*.

3.3 EXPECTED PERFORMANCE OF THE PREFERRED OPTION

3.3.1 General

Combining the Interests of the Stakeholders

The preferred option optimizes the total benefits (i.e., minimizes the overall costs) to the all the stakeholders as a group according to the specified weighting factors. In this manner it combines the interests of the various stakeholders based on the physical characteristics of the Nipigon watershed and the available supply of water.

Implementing the preferred option would result in a change in the water levels and flows that would otherwise have occurred under the management scheme represented by the 1951 to 1986 data. The preferred option tries to meet the targets of all the stakeholders. When the water supply provided by nature is not too much greater or not too much less than normal, water levels and flows satisfactory to most of the stakeholders can be obtained.. When net basin supply is either much more or much less than normal there will be adverse impacts as the degree of control is relatively limited. During these abnormal times, the strategy of the optimized option is to minimize the total impacts or costs to the stakeholders as a group according to the specified weighting factors.

Simulation of Flows and Levels

An indication of what changes could be expected from the preferred option was provided by the simulation using 36 years of historic data from 1951 to 1986. There is no way of knowing what will be the future natural inflow into the Nipigon watershed therefore there is no way of predicting what will be the future levels and flows. However, comparison of what would have happened from 1951 to 1986, if the preferred option had been in place, with what actually happened over that same time period provides an indication of the expected performance of the preferred option.

3.3.2 Results of Performance Simulation

Times Series

A time series, from 1951 to 1986, of the simulated weekly average Lake Nipigon water levels and Nipigon River flows, for the preferred option is presented in Figure 3.1 (four pages). The lake levels are at the top half of the page and the river flows are at the bottom half. The weekly average river flows can be considered as daily average flows, constant for a week. Note that the maximum and minimum flows are not shown. The simulated option is represented by the dashed line. For comparison purposes, the actual observed average weekly data are also plotted (solid line). The option simulation is not an exact prediction of what will happen. However, it does provide a good indication of the relative impact of the option based on the best available data. From Figure 3.1 one can see that **even with the preferred option, stakeholders will not always get their target levels and flows and that in the future there will continue to be periods of high and low lake levels and river flows** (i.e., 1970, high levels; 1982, low levels).

Discussion of Selected Performance Factors

Information detailing how the preferred option performed relative to the stakeholder penalty functions was presented in the *Options Report*. In comparing the performance, selected factors were chosen to represent those aspects of the lake level or river flow that are more important to each of the stakeholders. The factors used, along with the resulting values are summarized in Table 3.2.

Lake Nipigon

The average fall Lake Nipigon level for Option V (OPT5) is a slight improvement (i.e., 3 cm lower) over the observed fall level. The level is also less variable. The simulation shows that about seven out ten times (i.e., plus/minus one standard deviation), the expected fall level would be between 259.78 m (852.34') and 260.20 m (853.72') compared to the past typical range of 259.73 m to 260.31 m (852.17' to 854.08').

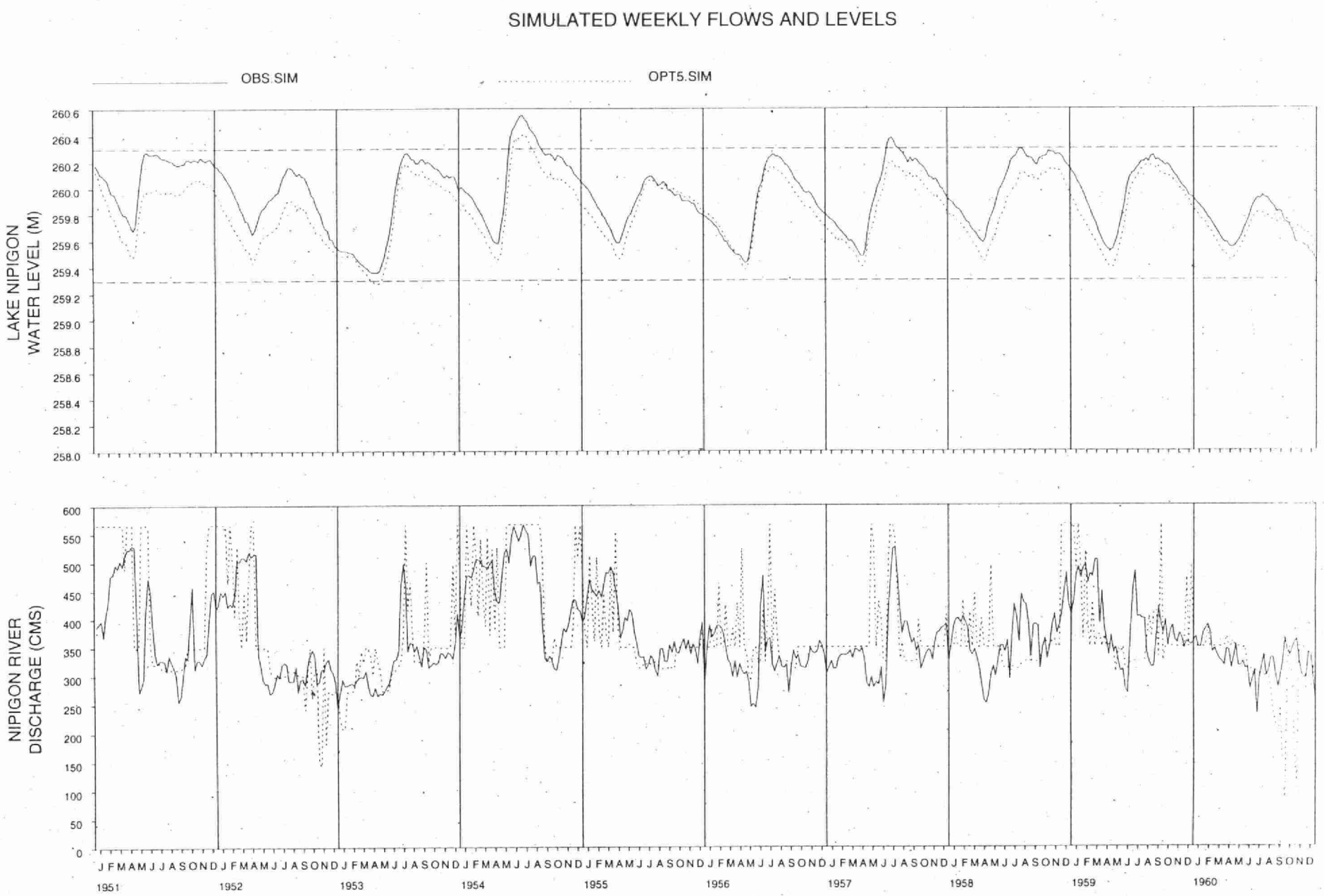


Figure 3.1 **Preferred Option - Simulated Lake Levels and River Flows, 1951 to 1960**

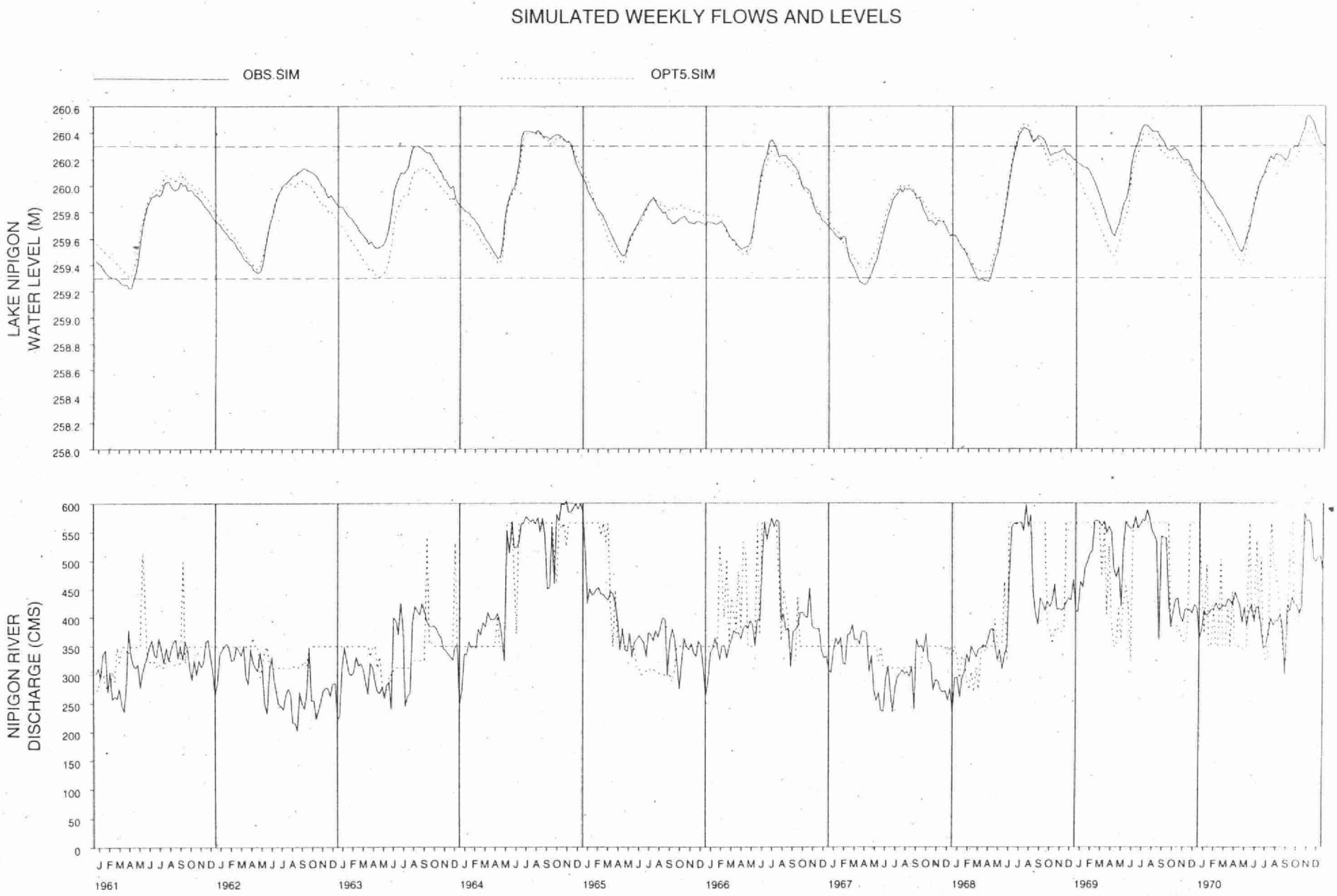


Figure 3.1 (cont'd.) Preferred Option - Simulated Lake Levels and River Flows, 1961 to 1970

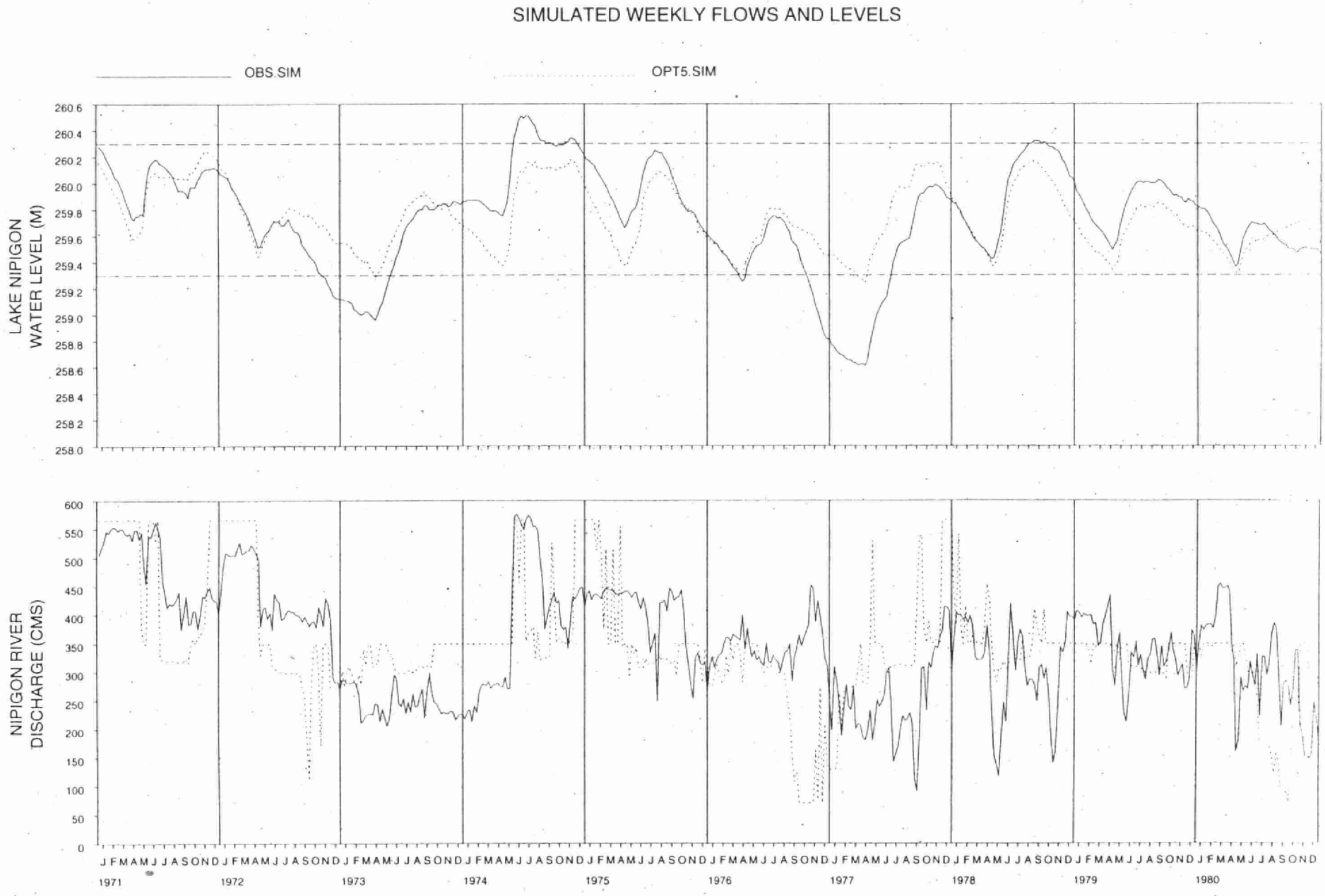


Figure 3.1 (cont'd.) Preferred Option - Simulated Lake Levels and River Flows, 1971 to 1980

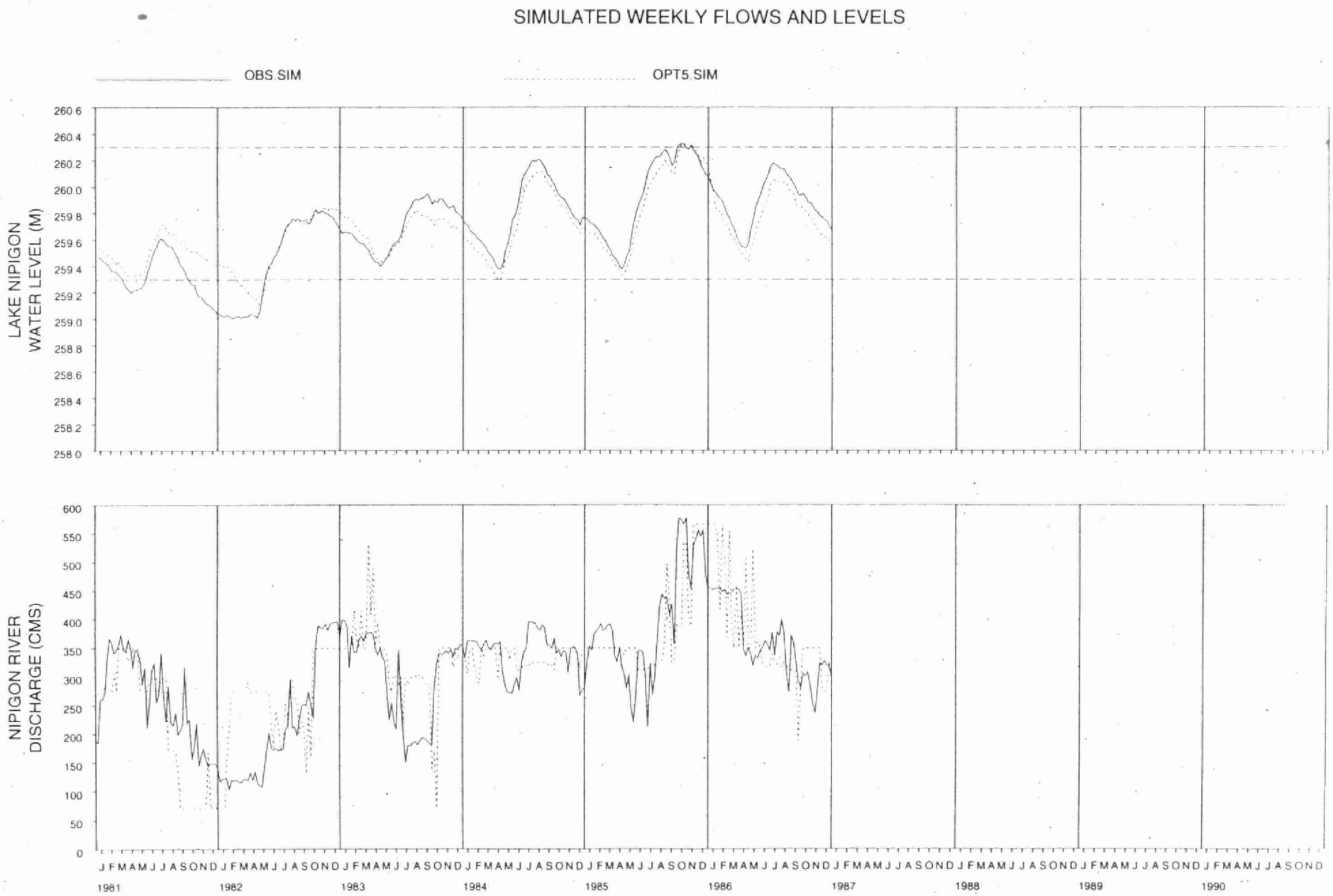


Figure 3.1 (cont'd.) Preferred Option - Simulated Lake Levels and River Flows, 1981 to 1986

Table 3.2 Performance of Preferred Option Relative to Penalty Functions

Stakeholder	Important Factor Selected for Consideration	Percent Change in Penalty Value Relative to Observed Data: (+) conditions improved; (-) conditions worse	Increase(+)/ Decrease(-) in Number of Weeks On Target Relative to Observed Data
Lake Nipigon fish	Penalty for average lake level below target from October to May and above target from October to November	+41	-88
Nipigon River brook trout	Penalty for minimum flow below target from October to May	+74	+559
Hydro-electric power	Total value of power ($)	+1.7	-673
Lake Nipigon shore owners/users	Penalty for average lake level above and below target	+44	+118
Lake Helen shore owners/users & boaters	Penalty for minimum flow below target and maximum flow above target	+17	-135
Town of Nipigon/Red Rock Indian Band water supply	Penalty for minimum flow below target	+85	+496

The average spring level for Option V is 5 cm lower than the observed level, but the variability is reduced thus making Option V better for Lake Nipigon fish. It is estimated that about seven out of ten times, the spring level will be between 259.29 m (850.73') and 259.45 m (851.26') compared to the past range of 259.19 m to 259.65 m (850.40' to 851.91').

The "fall to spring drawdown" is the drop in the Lake Nipigon water level from the maximum level in October and November to the lowest level the following spring. It should be noted that the fall to spring drawdown is not the total yearly drawdown. The level of the lake usually is at its greatest in July or August. Therefore the total yearly drawdown will be greater than the fall to spring drawdown. Typically (i.e., plus or minus one standard deviation), the fall to spring drawdown for the preferred option is between 0.46 m to 0.78 m (1.51' to 2.56') compared to 0.43 m to 0.77 m (1.41' to 2.53') for the observed data.

Option V improves water level conditions for Lake Nipigon fish by 41 percent and for the shoreline owners and users by 44 percent (i.e., it reduces the penalty value or severity of water levels outside of the target range). Option V has a greater weighting factor on Lake Nipigon stakeholders compared to Nipigon River stakeholders. The observed data shows that there were 523 weeks, from 1951 to 1986, when the water levels for the Lake fish were above the target for October and November or below the target for October to May. The penalty value was 94.4. With Option V (OPT5), the number of weeks increases to 611 but more importantly the penalty value drops to 55.9.

The observed 1951 to 1986 data shows that from May to November (a total of 1080 weeks), the level of Lake Nipigon was above the shore owners' and users' upper target level of 260.0 m (853.0') or below the lower target level of 259.4 m (851.0') 52 percent of the time (559 weeks). The total penalty for levels above and below the target range was 186.2. The preferred option reduces the number of weeks to 441 and the penalty value to 104.3.

Nipigon River

For brook trout on the Nipigon River (at Backpool, Parmacheene and Gapens Pool), the minimum flow potentially dropped below the target values during the critical spawning, incubation and hatching period (October to May) for a total of 853 weeks (67.7 percent of the time) out the possible total of 1260 weeks over the simulation period from 1951 to 1986. The sum of the penalty below the target flow for this same October to May period was 709.7. With the preferred option the number of weeks dropped to 294 and the penalty value (a measure of the severity of the low flow) decreased to 183.2. The minimum flow restrictions tend to keep the river flow conditions more suitable for the river stakeholders such as shore owners and users, boaters and Town of Nipigon/Red Rock Indian Band (water supply).

Option V (OPT5) provides an estimated average annual value of power of $30,365,000.00. Seventy-five percent of the time, there was enough water, at the right times, from 1951 to 1986, to reach very close to (97 percent or more) the hydro-electric power generation maximum flow target of 390 m^3/s.

For Lake Helen and Polly Lake shore owners and users, including boaters, the number of weeks, from the observed data, when the maximum flows were above or the minimum flows were below the target values for May to November were 136 and 817 weeks respectively. Combined these represent 88.2 percent of the total possible weeks from 1951 to 1986 and have a total penalty of 677. The preferred option increases the total number weeks when the flows are outside the desired range to 1088 but decreases the severity of the highs and lows (i.e., the penalty value) by 17 percent.

The minimum river flow was potentially below the Town of Nipigon/Red Rock Indian Band water supply target value of 180 m^3/s for 1,000 weeks (53.4 percent) of the total 1,872 weeks based on the observed data from 1951 to 1986. The penalty value was 480.8. The preferred option reduces the number of weeks down to 504 and the penalty value to 74.5.

3.4 RATIONALE FOR CHANGING THE WATER MANAGEMENT PLAN

3.4.1 Introduction

Certainly, the question has been asked: "Why change the management of water quantity the Lake Nipigon and the Nipigon River?". In the Study Team's view, the rationale for developing a new water management plan for the Nipigon system is based on a recognition of the increased demands being placed on the watershed and the conflicts which had arisen among the water resource users. Also changing social views have resulted in more people demanding input into how their natural resources are managed.

Perhaps the conflict with the highest profile or the most "publicity" has been the issue of impacts of fluctuating water levels on the brook trout in the lower Nipigon River. It may be said that the brook trout issue "kick-started" this study. The *Draft Options Report* presented the 1991 findings of the Nipigon Bay RAP. They had identified several potential impairments of beneficial uses in the lower Nipigon River, one of which was:

> "Water level fluctuations impact aquatic organisms and the habitat of the brook trout and other fall spawners."

The Nipigon River Management Committee then initiated this study in support of the Nipigon Bay RAP's *Use Goal #10* which made reference to maintaining water levels to allow natural reproduction of fish and other aquatic organisms. The study was to be carried out with public consultation.

During the first year of the study, as a result of the personal stakeholder interviews and analysis of the information, the Study Team recognized the natural resources importance of Lake Nipigon. The Study Team committed to the pursuit of an option for the management of the water levels and flows that, as a minimum, would "not further aggravate the impacts of fluctuating water levels on Lake Nipigon." This view remained constant through the second year of the study.

3.4.2 Past Management

According to the available records, Ontario Hydro has managed the levels of Lake Nipigon within the legal requirements agreed to with the Province of Ontario in Water Power Leases and Licences of Occupation. Water level records show that the mean daily levels did not exceed 260.6 m (855.0'). The Study Team recognizes that storm surge may have pushed short-term levels (say hourly) higher than 260.6 m (855.0') causing problems for property owners along the Lake. The Study Team is also cognizant of the issue regarding the clearing of the shoreline prior to increasing the flood level to 260.6 m (855.0'). Nevertheless, Ontario Hydro's present agreements provide flood rights to 260.6 m (855.0').

Ontario Hydro has internal operating directives which control their operations. Hydro's operating range for the lake is from 259.3 m (850.8') to 260.3 m (854.0') which is indicated by the horizontal dashed lines on the lake level plot in Figure 3.1. However, the target levels for the Lake Nipigon fish, which more closely match the estimated natural fluctuations, are slightly higher for the spring levels and slightly lower for the fall levels.

The Study Team did not find information that placed specific restrictions on the discharge from the generating stations. The present agreement on minimum flow rate (260 m^3/s from October to May) is an interim working arrangement between MNR and Hydro. Hydro also has internal policies for other considerations such as the safety of the railway bridge in Nipigon and the Town of Nipigon's water supply.

3.4.3 Changing the Water Management Plan

The present "water management plan" is based on Ontario Hydro's legal requirements and ad-hoc working agreements with the Ministry of Natural Resources. The legal requirements and ad-hoc arrangements did not involve a wider consultation with all the stakeholders. This approach may have been acceptable in earlier times when the interests of the other stakeholders were not appreciated or recognized. This is no longer the case. Walden and Cousins (1992) made the following observation regarding the Lake of the Woods Control Board which has been in the business of managing water levels for more than 70 years:

> "For at least the first half of its existence, it was possible for the Board to operate with very little public involvement. The number of recognized interests were fewer then, and public consultation was generally not expected. However, our society is evolving. Given higher education, more leisure time, greater demands for the rights of the individual, and a belief that natural resources belong to all of us, the public is no longer willing to sit back and trust the actions of any resource management agency."

A similar view has been expressed in the past by a member of the Study Team (Evans 1990), and repeated during the study process:

> "Where, at one time, people entrusted and trusted experts, elected officials and public servants to make decisions, people no longer feel that decisions about matters that affect them should be made without their being consulted."

The Study Team found a marked level of dissatisfaction with the present procedures for managing the levels and flows. Many stakeholders are fed up that they do not have a more direct voice in the decision process that affects them. This dissatisfaction is compounded by a lack of information on what is happening with the water levels and flows and, at times, by a lack of understanding, on the part of some of the stakeholders, of the physical processes involved. Some do not appreciate how limited the control over the system actually is.

The management of the levels and flows must be fair and just as important it must appear to be fair. The development of a water management plan for the Nipigon system must recognize and include the input of the stakeholders.

3.5 SELECTING THE PREFERRED OPTION

Approach

As was stated in the *Options Report*, the penalty functions are the Study Team's best approximations of the costs incurred by the stakeholders based on the available information. Also, the reader is reminded that the weighting factors are subject to some debate because who can really know and articulate what a pluralistic society's preferences are? Thus, there is some uncertainty in the planning objective for this as well as any other water resources analyses. The purpose of optimization models is not necessarily to identify the single best solution, even if a single, well defined planning objective could be agreed upon. Rather they are intended to eliminate those alternatives that are clearly inferior. Multi-objective analyses do not yield single optimal solutions, but are more useful at identifying the trade-offs among conflicting noncommensurable objectives. The selection of the "best compromise" solution from among those options with only marginal differences is, in the end, a management decision (Loucks et al. 1981).

Narrowing the List

The *Options Report* presented an initial comparison of the options which is repeated herein. From those observations, options which were considered to be inferior were discarded from further consideration. Comparison of the options, relative to the total penalty of flows and levels above and below the target values, indicated that Options I (RIVFISH), II (LAKEFISH), III (HYDRO) and VII (HYDFISH) were the least desirable. Options I (RIVFISH), III (HYDRO) and VII (HYDFISH) result in significantly worse water level conditions for Lake Nipigon fish. Option I (RIVFISH) also reduces the value of the power slightly. Option II (LAKEFISH) makes the flow conditions worse for Lake Helen/Nipigon River shore owners, users and boaters and also reduces the value of the power.

All the options, except Options I (RIVFISH) and III (HYDRO), improve the Lake Nipigon fall maximum water level conditions by a combination of lower averages and reduced variability. Reduced variability results in greater consistency in the lake levels. The lake does not go up as high or down as low as the observed data during wet and dry times respectively.

All the options, except Option II (LAKEFISH), lower the average minimum spring (April and May) water level. However, the reduced variability of the spring water levels with Options VI (FISH) and V (OPT5) offsets these lower average levels resulting in better overall spring conditions for those options.

For all the options, increasing the minimum flow restriction from 110 m^3/s to 270 m^3/s, during the months of October to May, significantly improves flow conditions for stakeholders on the river, especially the brook trout. Comparing the results of different minimum flow restrictions indicated that decreasing the winter minimum flow restriction would improve the Lake Nipigon water level conditions for fish but not without a significant accompanying decrease in the suitability of the Nipigon River flow conditions for the brook trout.

Based on all of the above considerations, Options I (RIVFISH), II (LAKEFISH), III (HYDRO) and VII (HYDFISH) were dropped from further consideration.

Remaining Options

The remaining options, IV (OPT4), V (OPT5) and VI (FISH) perform in a similar manner for the all the stakeholders, except V (OPT5) which is significantly better than VI (FISH) and IV (OPT4) for Lake Nipigon fish. Option VI (FISH) also results in a relatively small (in terms of percentage of total value of power) decrease in the value of the hydro-electric power. The performance of these options is compared as follows:

	Improvements		
Stakeholder	IV (OPT4)	V (OPT5)	VI (FISH)
• Lake Nipigon fish	7.7%	41%	29%
• Nipigon River brook trout	76%	74%	79%
• Hydro-electric power	2.2%	1.7%	-1.1%
• Lake Nipigon shore users	39%	44%	44%
• Lake Helen shore users/boaters	24%	17%	16%
• Town of Nipigon/Red Rock Indian Band water supply	89%	85%	91%
• Lake Nipigon boaters	27%	33%	31%

Lake Nipigon Fish

A significant difference is that Options IV (OPT4) and VI (FISH) improve Lake Nipigon fish water level conditions 7.7 percent and 29 percent respectively while Option V (OPT5) improves the conditions 41 percent. This is because Option V (OPT5) has a greater weighting factor on Lake Nipigon stakeholders compared to Nipigon River stakeholders. With a minimum flow restriction of 270 m^3/s or greater from October to May, higher weighting factors are necessary for Lake Nipigon stakeholders, relative to the river stakeholders, in order to keep Lake Nipigon water levels as close as possible to the desired conditions for fish in the lake. With the minimum flow restriction of 270 m^3/s in the winter, the weighting factor for the Nipigon River brook trout becomes less critical.

The fishery on Lake Nipigon is very valuable as a commercial, subsistence and angling resource. The interests of other users are linked with the Lake Nipigon fisheries. Wildlife that depend on the fish in lake, shoreline flora and fauna, commercial fisherman, First Nation subsistence fishermen, anglers (both local and tourist alike), and local tourist businesses (charter operators, restaurants, motels, suppliers) will clearly benefit if the Lake Nipigon fishery is healthy. A healthy fishery dominated by native species is one indicator of a healthy environment. The public consultation afforded the fisheries and the environment the highest priority.

An important point to remember is that the natural water supply to the Nipigon basin plays the largest role in determining the lake levels and river flows. This is particularly evident during periods of high or low water inflow.

Nipigon River Brook Trout

All three of the remaining options result in similar improvements in the water level conditions for the brook trout in the lower Nipigon River which is the goal of this study. Reducing the range of river fluctuations would also benefit spring spawners, such as northern pike, and river benthos. Other users' interests are closely linked with the Nipigon River fisheries. Wildlife that depend on the fish in the river, river benthos, First Nation subsistence fishermen, anglers (both local and tourist alike), and local tourist businesses (charter operators, restaurants, motels, suppliers) will benefit if the native Nipigon River fishery is healthy. A healthy fishery dominated by native species is one indicator of a healthy environment.

Hydro-electric Power Generation

Both Options IV and V place a 10 percent weighting factor on hydro-electric power generation placing it third on the priority list behind Lake Nipigon fish and Nipigon River brook trout. This ranking is consistent with the order of priorities determined by the Nipigon River Management Committee, the Working Group and the public response (i.e., fish and environment on Lake Nipigon and Nipigon River given highest priority and hydro-electric power given either a second or third place ranking). It also appears to be appropriate when compared to the results of Option VII

(HYDFISH). There is only a small decrease in the average annual value of power from Option VII (HYDFISH) to Options IV (OPT4) and V (OPT5) (1.5 percent and 1 percent respectively). Option VII (HYDFISH) placed a weighting of one-third on hydro-electric power generation and one-third each on the fish in Lake Nipigon and the Nipigon River brook trout.

The average annual value of the power generated by the three options varies from $29.54 million to $30.52 million. The simulation estimates marginal increases in values for Options IV (OPT4) and V (OPT5) and a marginal decrease for Option VI (FISH) compared to the estimated observed value.

The minimum flow requirement does decrease the total value of the power generated during periods of lower than normal water inflow (i.e., dry years) by limiting the peaking capacity of the plants. However, as was noted in the *Options Report*, optimized options with higher minimum flow restrictions (i.e., 270 m^3/s and 170 m^3/s versus 110 m^3/s and 170 m^3/s) can provide more value overall. The simulations indicated that the reduced values during on-peak periods and dry years were more than offset by the increased values during the off-peak periods and the normal years. It has already been noted that there is sufficient water in the system to virtually meet the maximum flow target for hydro-electric generation 75 percent of the time. The unit system marginal costs used in this study were provided by Ontario Hydro and represent the value Hydro presently places on on-peak and off-peak power at different times of the year. The simulations of the options would thus indicate that the difference in the value between the on-peak and off-peak power is not as significant as it was in the past. In fact, Ontario Hydro has reported that Nipigon River generation has declined in importance as electrical demand increased requiring additional resources in the Northwest Region. Fossil-fired thermal plants at Thunder Bay and Atikokan and construction of the east-west tie line combined with private sources of generation have lessened the dependence on the Nipigon system for peaking requirements (pers. comm. B. Vinski, Ontario Hydro, January 27, 1993).

Permitting Ontario Hydro to drop the minimum river flow to 110 m^3/s (on an hourly basis during the off-peak demand period, midnight to 7:00 a.m.), while maintaining the average flow conditions calculated by Option V (based on the minimum flow restrictions of 270 m^3/s and 170 m^3/s), would increase the average annual value of power for Option V (OPT5) by $314,000 per year (1.0 percent of the total average annual value). However, the increased value of power would be accompanied by a significant decrease in the suitability of the flow conditions for the river brook trout as well as other river stakeholders. For example, the penalty value for the Nipigon River brook trout increased to 368.7 from 183.2 (2 times less suitable). Stated another way, for Option V (OPT5), over the 36 year simulation period, the number of years when the flow, from early October to late May, went below 260 m^3/s for one or more weeks, increased from 7 to 23 when peaking down to 110 m^3/s was permitted.

Other Stakeholders

The relative differences between the performance of the three options (IV, V and VI), with respect to the other stakeholders, including shore owners and users, water supply users and boaters, are not significant. All these other stakeholders see conditions improve.

Other lake users' interests are closely linked with the Lake Nipigon and Lake Helen/Polly Lake shoreline property owners including wildlife which is adversely affected by flooded shorelines (directly by not having the shoreline as a habitat; and indirectly through increased sedimentation caused by erosion of the shore), First Nation peoples who have traditional areas flooded, users of swimming beaches who see their beach widths diminished and beachcombers (including those from the charter boats) who have nowhere to walk when the shore is flooded. These other users will benefit if the water levels are maintained within a more natural range.

The lower priority accorded the shoreline owners and users is a reflection of their ability to more readily adapt to changing conditions relative to the other stakeholders such as the fisheries and the lower dollar values involved relative to the production of hydro-electric power. Similarly, boaters were not considered as needing separate weighting factors because of their high flexibility to adapt to changing conditions. As well, the interests of the boaters are very similar to the interests of the shoreline owners and users.

The Town of Nipigon and the Red Rock Indian Band (Lake Helen reserve) water supply is adequately protected by the specified minimum flow restrictions and are covered by the interests of the shore owners and users.

Selection Summary

In summary, Option V (OPT5) was selected as the preferred option for the following reasons:

- significantly improved the water level conditions for the brook trout on the lower Nipigon River meets the goal of the study;
- strong recognition of the importance of the Lake Nipigon fish, reflecting public input, resulting in significantly improved water level conditions, meets the goal of the study;
- marginal difference in the value of hydro-electric power generated (relative to the estimated total average annual value of approximately $30 million dollars);
- improved conditions for other stakeholders which meets the goal of the study.

4.0 RECOMMENDATIONS FOR IMPLEMENTING THE PREFERRED OPTION

Chapter 4.0 provides recommendations for implementing the preferred option including stakeholder and public input in managing the water levels and flows in the Nipigon system and other further work.

4.1 PUBLIC ADVISORY COMMITTEE

It was stated earlier on that the management of the levels in Lake Nipigon and the flows in the Nipigon River must be fair and just as important it must appear to be fair. To be and appear fair and to make the best overall use of the water available, the water management plan for the Nipigon system must recognize the interests of all the stakeholders and continue to include the input of the stakeholders.

The Study Team recommends that a group be established to provide ongoing public input into the regulation of the level of Lake Nipigon and the flows in the Nipigon River. For the purpose of this report, this group shall be referred to as the Public Advisory Committee.

The role of the Public Advisory Committee would be to continue conveying the local stakeholders' preferred Lake Nipigon water level and Nipigon River flow criteria to Ontario Hydro and to advise Ontario Hydro of any concerns or adverse conditions. With public input, through the Public Advisory Committee, along with the ongoing input of the Ministry of Natural Resources regarding fisheries and natural resource management issues, Ontario Hydro could then regulate the levels and flows in such a manner as seems best calculated to afford stakeholders having diverse and conflicting interests on the lake and river a fair and reasonable use of the waters of the lake and river.

It is important that the views expressed by the Public Advisory Committee be incorporated into Ontario Hydro's decision making process.

The Public Advisory Committee should have membership which ensures two-way communication between the various interests in the watershed and Ontario Hydro. Membership should include:

- Lake Nipigon commercial fishing;
- First Nations;
- Nipigon River users;
- Lake Nipigon users;
- Lake Nipigon anglers;

- Nipigon River anglers;
- lower Nipigon River (including Lake Helen and Polly Lake) shoreline property owners;
- Lake Nipigon shoreline property owners;
- Lake Nipigon tourism concerns; and
- Nipigon River tourism concerns.

The Ministry of Natural Resources, while not expected to be a member of the Public Advisory Committee, will continue to have responsibility for fisheries and natural resources issues.

The mission of the Public Advisory Committee would be to:

- provide public input into the development of an operational plan;
- provide continued public input into Ontario Hydro's regulation of the levels and flows for the best possible long-term beneficial use of all stakeholders;
- assist Ontario Hydro and the Ministry of Natural Resources establish a protocol for dealing with short-term deviations from the established operational plan (i.e., emergency situations such as spills, equipment repairs, routine situations such as maintenance, placement of navigation buoys, courtesy flow reductions);
- assist in establishing criteria for monitoring the performance of the plan;
- be part of the process that reviews the performance of the plan;
- provide public input in updating and improving the plan as warranted by the results of further studies and experience;
- provide advice on how to best keep the public informed of water levels and flow conditions on an ongoing basis; and
- provide advice on how to best undertake public education initiatives to increase the understanding of the natural hydrologic system and the water management plan.

4.2 OPERATIONAL PLAN

The computer model used in this study was developed for strategic planning purposes and was intended for the development of a water management policy. The preferred option does not detail a full, real-time (i.e., day-to-day), operational plan. A detailed operational plan needs to be developed within the framework of the preferred option and should involve ongoing stakeholder and public consultation.

A model can be developed for real-time operation using the recommended policy of the preferred option (Option V (OPT5)). The real-time operational model would have to take into consideration other system contingencies. It has been noted previously that the present management of the water levels and flows is limited by the physical processes (i.e., inflows). The watershed is large and nobody has the ability to accurately and reliably predict future inflows. These physical limitations will still exist with the operational plan.

The option simulations used in this study used the historic net basin supply which includes the water from the Ogoki diversion. No change was made to the pattern or volume of inflow from the Ogoki. Therefore, the preferred option resulted in the same total volume of water being available to generating stations downstream of Nipigon (i.e., Niagara and St. Lawrence River). On this basis, there would be no change in the amount of power that the downstream stations could produce. It is expected that the operational model will consider the Ogoki inflow as a variable.

Peaking

Peaking for power generation in the Nipigon River was implicity taken into account in the stochastic dynamic programming model used in this study. The modelled daily peaking procedure was assumed to be such that the maximum flow released from the generating stations would occur for 16 hours during the on-peak period, and then the flow would be reduced to a minimum flow for 8 hours.

It should be noted that the computer model used in this study considered only one on-peak period and one off-peak period per day (24 hours) and that these were constant for any given week. Also, the model assumed that the change in flow, from the maximum value during the on-peak period to the minimum value during the off-peak period, occurred instantaneously (i.e., in the hour from 11 p.m. to midnight, the flow is at its maximum and then from midnight to 1 a.m., the flow is at its minimum). These model arrangements were necessary simplifications of the actual operation of the hydro dams where the flows are not changed instantaneously. Arrangements between Ontario Hydro and the Ministry of Natural Resources place some restrictions on how rapidly the flow can be decreased from maximum to minimum. Various restrictions were discussed on page 70 of the *Draft Options Report* (Atria, 1993). Subsequent to that report, the Study Team was advised (B. Lomenda, Ontario Hydro, pers. comm.) that the procedure at that time permitted an initial reduction in flow of 100 m^3/s with further 50 m^3/s reductions every 2 hours. In addition, there is also a peaking consideration from weekdays to the weekend.

Agreements between Ontario Hydro and the Ministry of Natural Resources regarding the stepped peaking of the generating stations should be included in the operational plan and should include consideration of the other stakeholders.

4.3 PUBLIC INFORMATION AND EDUCATION

Stakeholder's ability and willingness to adapt to changing water levels increases with their knowledge of what is happening and their understanding of how things happen. A program of public information and public education will keep the public informed. The recommended Public Advisory Committee should be able to draw on the experience of existing control boards and advisory groups to assist them in establishing the public information and education programme.

Public Information

A water level and flow bulletin should be prepared and distributed regularly so that people can see graphically the relationship between precipitation, inflows, outflows and the resulting lake levels.

An automated telephone information system with a recorded message which provides an update of current levels and flows and anticipated levels and flows over the next week should be provided. The message could also provide information on upcoming scheduled events such as decreased flows for maintenance purposes.

Public Education

Displays illustrating the natural processes of the Nipigon watershed should be prepared for meetings and open houses. The displays should explain the basic hydrologic cycle (i.e., precipitation, transpiration, evaporation, surface runoff) and the fundamental continuity equation (i.e., inflow into the lake - outflow from the lake = rate of change in storage in lake; where the rate of change of storage is given by the water levels). The displays could demonstrate the relationship between precipitation and levels and flows.

4.4 FURTHER RESEARCH AND PERFORMANCE MONITORING

This study was carried out using the best available information. Advances in our understanding of fishery and water use issues through research, including more details on fish spawning behaviour, elevations and flow requirements, will benefit future work in the Nipigon watershed.

The fact that we can always benefit from more knowledge should not be used as an excuse not to move forward with the existing recommendations. We can commence to make improvements now. We will wait forever if we wait for "all the information". The results of the preferred option should be monitored with further study and experience determining the ongoing regime.

The performance of the preferred option relative to the penalty functions will provide an indication if the simulated Lake Nipigon level or Nipigon River flow conditions are closer to or further away from the desired conditions. It should be noted that improvements in fishery habitat can take years to show up. Also, one is reminded that the penalty functions only refer to the water quantity (i.e.,

lake water level and river flow conditions) interests of the stakeholders. In the *Options Report*, readers were cautioned that the graphs did not say that with Option V there would be 74 percent more brook trout in the river and 41 percent more fish in the lake. It only said that level and flow conditions for those stakeholders would have been better by those amounts.

4.5 OTHER RECOMMENDATIONS

A database should be established for the Nipigon basin. Relevant information would include precipitation, Ogoki diversion flows, hourly Lake Nipigon levels, hourly Nipigon River discharges, hourly Lake Helen levels and Lake Superior levels.

Lake Nipigon Water Levels

Future determination of flood level limits should take into consideration the differences between mean levels and short term flood levels (which include storm surge).

Water Level Gauges

At least two water level gauges should be maintained on Lake Nipigon in order to obtain the best estimate of mean lake level. Mean lake levels are required to compute net inflows to the Nipigon basin. Both spatial and temporal averaging of hourly recorded levels should be used to minimize the effects of storm surge and other water surface disturbances. In addition, having two gauges means that there will likely be at least one operational in case of a malfunction of the other. There are two gauges at the present; Macdiarmid and Wabinosh.

At least one water level gauge should be reinstated on Lake Helen. Previously, a gauge had been maintained at Steamboat Bay.

The database for the Nipigon watershed should also include the daily water levels for Lake Superior. These are available from the federal government.

Polly Lake Shoreline Elevations

The penalty functions for the Lake Helen/Polly Lake shoreline owners and users are based on the estimated elevations of the shoreline properties at Polly Lake. The accuracy of the functions could be improved based on more accurate topographical information. A simple topographic survey, referenced to a known benchmark (to Canadian Geodetic Datum) would suffice.

REFERENCES

Atria 1993. Nipigon River: Development of a Water Management Plan, Draft Options Report. Prepared for Nipigon River Management Committee by Atria Engineering Hydraulics Inc., May, 123pp +Appendices

Atria 1994. Nipigon River: Development of a Water Management Plan, Options Report. Prepared for Nipigon River Management Committee by Atria Engineering Hydraulics Inc., April, 66pp +Appendices

Evans, D. 1990. Public consultation: A practitioner's experience in government. Proceedings International Conference on Remedial Action Plans in the Lake Superior Basin. Lakehead University, Centre for Northern Studies, Occasional Paper #9.

Loucks, D.P., J.R. Stedinger and D.A. Haith, 1981. Water Resource Systems Planning and Analysis. Prentice-Hall, Englewood Cliffs, N.J., 559p.

Walden, R.F. and Cousins, J.R. 1992. Managing the Water Resources of the Winnipeg River Drainage Basin. Canadian Hydrology Symposium, Winnipeg Manitoba.

APPENDICES

NIPIGON RIVER:

DEVELOPMENT OF A WATER MANAGEMENT PLAN

FINAL REPORT

September 1994

APPENDICES

A - *UPDATE* newsletter, Volume 4: April, 1994

B - Public Consultation - Response to the April, 1994, Update Newsletter

C - Press Release (May 30, 1994)
- Working Group Notice of Meeting (April 26, 1994)
- Advertisement of Final Working Group Meeting

D - June 3, 1994, Letter from Rocky Bay Fisheries Unit to Atria Engineering

Appendix A

UPDATE newsletter, Volume 4: April, 1994

NIPIGON RIVER WATER MANAGEMENT PLAN STUDY

UPDATE

Volume 4 • APRIL 1994

This newsletter is another in a series of regular updates on the progress of developing a water management plan for the Nipigon River system. This project was initiated by the Nipigon River Management Committee, which includes representatives from the Ontario Ministries of Natural Resources and Environment and Energy, Ontario Hydro, Environment Canada, Fisheries and Oceans Canada, and the Nipigon Remedial Action Plan Public Advisory Committee. If you have any questions or comments about the information contained in this newsletter or the overall progress of the study, please call the Project Manager, Mark Kolberg of Atria Engineering, collect *at (905) 891-0020.*

Options Report released

The *Options Report* for the Development of a Water Management Plan for the Nipigon River has just been released. You may recall that the *Draft Options Report* was released last year in May 1993. It summarized information and issues regarding water level fluctuations in the Nipigon system and identified some conceptual management options to address stakeholder concerns. The followup *Options Report* is now being circulated to those stakeholders who had expressed an interest in receiving it. The *Options Report* outlines the continuing public consultation process and describes how the interests of the various stakeholders have been taken into consideration. It describes in detail a range of options for managing the water quantity in the Nipigon system. This issue of Update will provide you with a summary of the *Options Report*.

The Nipigon River Water Quantity Management Working Group

One of the ways the Study Team has tried to integrate the views of the community into the Study has been through a series of meetings with a community-based committee. Called the Working Group, it has met regularly since June of 1993 to discuss the progress of the Study. The Working Group will meet once again this June to assist the Study Team in developing its *Final Report* which is still to come.

Consultation continues

The *Options Report* makes no recommendations – they are still to come. The Study Team will review the comments it receives during this phase of consultation and then, based on the technical work it has conducted during the past two years, the stakeholder comments it has received, and input from the Nipigon River Water Quantity Management Working Group, the Study Team, in its *Final Report,* will make a recommendation proposing its preferred management option.

Identifying 'Best' Levels

Based on issues raised by the stakeholders and further consultation, the Study Team was able to determine what would be the best – the optimum – water level or flow for each stakeholder. It also looked at how significant an impact a slightly lower flow or level would have, and in turn a slightly higher flow or level would have on each of the stakeholder's ideal.

A reminder of Issues raised by the Stakeholders

Field interviews conducted by the Study Team during the last two years identified the following groups of stakeholders and their concerns with respect to water management along the Nipigon River system:

1) **those concerned with brook trout and other fish on the lower Nipigon River:** lower water levels between October and May disrupt spawning, incubation and hatching; conditions harmful to brook trout have spin-off effects on other fish species and wildlife; in addition to water levels, these stakeholders also were disturbed by large fluctuations that may increase erosion and further exacerbate the risks to the fishery;
2) **those concerned with fish species in Lake Nipigon** – namely whitefish, walleye, lake trout, and brook trout: similar issues to those concerned about fish in the River except these stakeholders have as their primary interest the fish in the Lake;
3) **those concerned with maximizing hydroelectric generating capacity:** Ontario Hydro has an interest in maintaining as high a range as possible in flow rates to maximize both the quantity and the efficiency of the power that can be generated;
4) **shoreline owners and users of Lake Helen and Polly Lake, and shoreline property owners along the River:** these stakeholders want minimal water level fluctuations so that boating and swimming is not disrupted, want to minimize erosion caused by too high levels and rapid take-downs, and want a minimum level high enough that the shoreline is attractive;
5) **shoreline owners and users on Lake Nipigon:** cottagers want minimal fluctuations, want the level of the Lake kept low enough that the risk of erosion and property damage is minimized;
6) **boaters on Lake Nipigon and Lake Helen:** generally want less fluctuation, so that their is some predictability to their boating use;
7) **Town of Nipigon and Red Rock Indian Band**: low levels and fluctuations make extra filtering necessary for their water supply.

Stakeholder Issues weighted

As you may expect, some of the stakeholder concerns are compatible – for instance both Polly Lake cottagers and the Town of Nipigon want water levels that don't get too low, or fluctuate a lot. Others conflict – those who want to maximize the power-generating capacity of the River may want to bring Lake Nipigon levels lower than those who want the lake fish protected. The Study Team tried to determine how these concerns compared in importance to each other. Which was more important than the other? Which were of equal importance? It did this with the help of members of the public and the Working Group.

Relative Weighting of Stakeholders

Stakeholder/Issue (Lake Nipigon & & Nipigon River	Public Meeting Comment Sheets	Working Group*	Management Committee*
Fish & spawning habitat	high	1	1
Cost of electricity	moderate to low	3	2
Shoreline owners & users	moderate	2 to 3	3
Boaters	moderate	4	5
Nipigon water supply	not specified	5	5

** Out of a scale of 1 (higher importance) to 5 (lower importance)*

Summary of Options

Once it had determined the relative importance of each issue, the Study Team drew up seven options, each favouring a particular issue or blend of issues.

Summary of Options

Option	Description	Weighting Factors	
I RIVFISH	Nipigon RIVer FISH (brook trout) most important consideration. Try to maintain River flows between 350 m^3/s & 400 m^3/s in October & November and above 270 m^3/s from December to September.	100%	Nipigon River brook trout
II LAKEFISH	LAKE Nipigon FISH most important consideration. More closely mimic natural Lake Nipigon average fluctuations by trying to get levels between 259.85 m & 259.8 m (852.6' & 852.4') during October & November, between 259.8 m & 259.49 m (852.4' & 851.4') from December to May, and between 259.49 m & 260.0 m (851.4' & 853') from June to September.	100%	Lake Nipigon fish
III HYDRO	HYDRO electric power generation most important . consideration. Try to maintain maximum daily River flow at 390 m^3/sthroughout the year.	100%	hydro power generation
IV OPT4	OPTion combining the interests of various stakeholders with equal consideration to River and Lake interests and with a high importance placed on fish on both the River and the Lake.	45% 35% 10% 5% 5%	Lake Nipigon fish Nipigon River brook trout hydro power generation Lake Nipigon shore owners/users Lake Helen shore owners/users
V OPT5	OPTion combining the interests of various stakeholders. Similar to OPT4 but with greater emphasis on Lake fish.	60% 25% 10% 2.5% 2.5%	Lake Nipigon fish Nipigon River brook trout hydro power generation Lake Nipigon shore owners/users Lake Helen shore owners/users
VI FISH	Equal combination given to FISH from Lake and River (brook trout).	50% 50%	Lake Nipigon fish Nipigon River brook trout
VII HYDFISH	Equal consideration given to HYDro and Lake and River FISH.	33 1/3% 33 1/3% 33 1/3%	Lake Nipigon fish Nipigon River brook trout hydro power generation

Note: All the options, unless otherwise specified, are based on maintaining a minimum flow, when possible, in the Nipigon River of 270 m^3/s from October to May and 170 m^3/s from June to September.

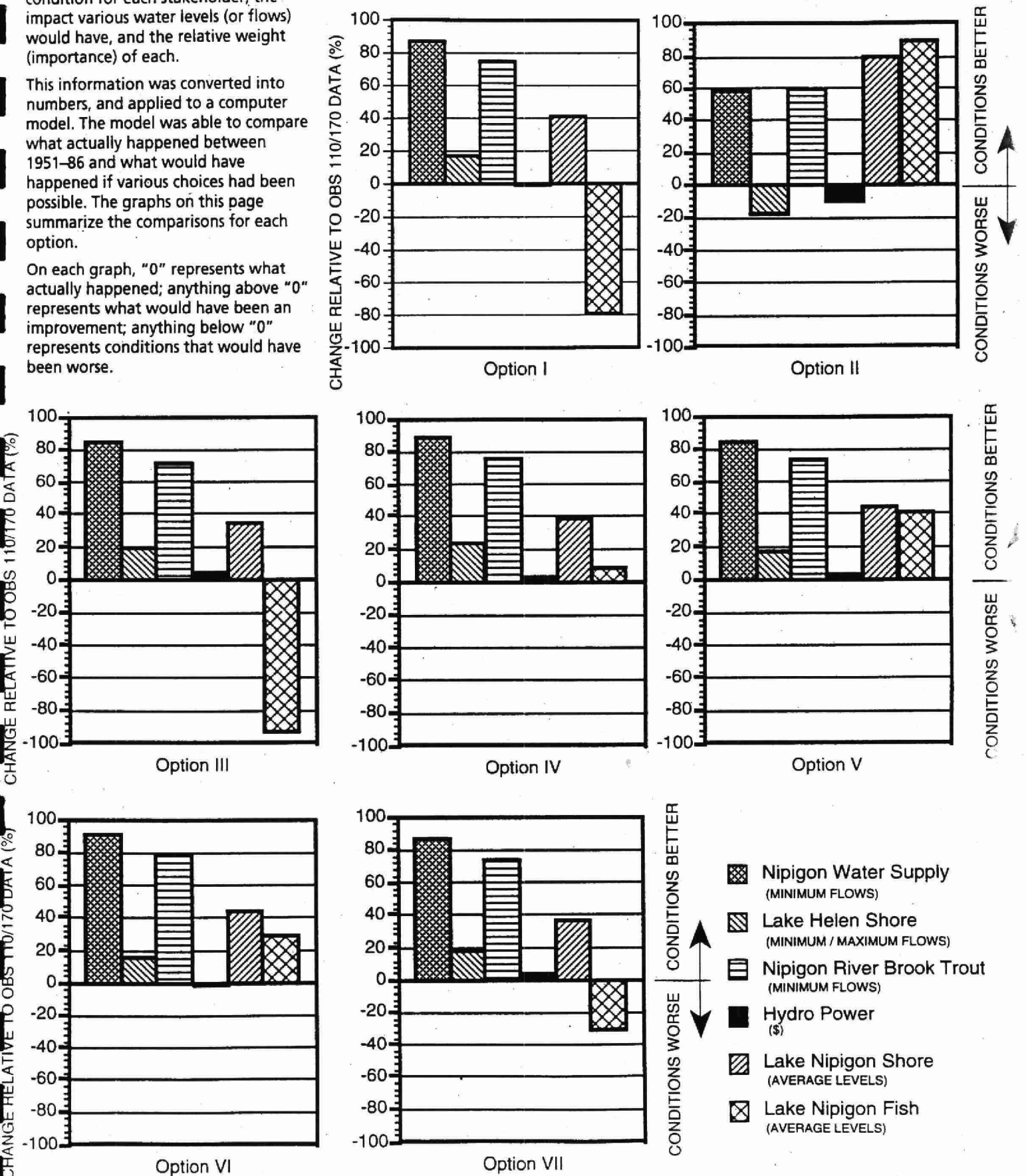
Use of Computer Model

The Study Team determined the ideal condition for each stakeholder, the impact various water levels (or flows) would have, and the relative weight (importance) of each.

This information was converted into numbers, and applied to a computer model. The model was able to compare what actually happened between 1951–86 and what would have happened if various choices had been possible. The graphs on this page summarize the comparisons for each option.

On each graph, "0" represents what actually happened; anything above "0" represents what would have been an improvement; anything below "0" represents conditions that would have been worse.

Comparison of Options: LAKE LEVEL/RIVER FLOW CONDITIONS



Comparison of Options

Although not exact predictions of what will happen, the computer model allowed the Study Team to simulate what the effects might be of each Option. Here are some initial thoughts on what the model has told us:

- Options I, III and VII result in significantly worse water level conditions for the fish in Lake Nipigon;
- Option II makes the levels and flow conditions worse for Lake Helen/Nipigon river shore owners, users and boaters, and also reduces the value of the hydro power generated;
- Remaining options IV, V and VI are quite similar in their effects on all stakeholders, except Option V which is significantly better for the fish in Lake Nipigon, and VI which reduces the value of hydro power generated.
- The annual value of power generated by each of the options varies between $29.54 million and $30.86 million.

What do you think?

As you can see, the Study Team has many factors it must take into account in making a recommendation for a preferred management Option. Remember the goal of this study:

> "is to establish, through public involvement, a management option that will reduce the impacts of the operation of Ontario Hydro's Nipigon River hydroelectric dams on the Lake Nipigon/Nipigon River watershed, particularly on the Nipigon River fishery. This management option for the Nipigon River must not further aggravate the impacts of fluctuating water levels on Lake Nipigon."

Which option achieves this goal?

Does it address the concerns of all the stakeholders? Does your chosen Option represent a fair compromise? Who is most affected? Least affected?

Do you have any other suggestions as to how the impacts of the water level fluctuations can be minimized, in addition to the implementation of one of these Options?

Working Group Meeting • June 9, 1994

The last Working Group meeting is scheduled for June 9, 1994 from 7:00 to 9:00 p.m. at the Legion Hall in Nipigon. The Working Group will discuss the outcome of the public consultation. It is anticipated that they will be in a position to decide on a preferred option for recommendation to the Study Team. The meeting is open and everyone is welcome to attend.

Please fill out the tear off sheet below and return it no later than May 31, 1994 to Mark Kolberg, Atria Engineering, 8 Stavebank Rd. N., #401, Mississauga, Ontario L5G 2T4.

Name _____
(PLEASE PRINT)
Address _____

_____

Phone _____

Why are you interested in the Nipigon River Water System?

- ☐ have a camp on _____
- ☐ operate tourist operation on _____
- ☐ operate commercial fishing on _____
- ☐ I sport fish on _____
- ☐ I take my livelihood from _____
- ☐ I hunt on _____
- ☐ Other _____

I prefer this option:

- ☐ Option I
- ☐ Option II
- ☐ Option III
- ☐ Option IV
- ☐ Option V
- ☐ Option VI
- ☐ Option VII

- ☐ I wish to receive a complete copy of the *Option Report.*

Other comments:

Appendix B

Public Consultation - Response to the April, 1994, Update Newsletter

NIPIGON RIVER WATER MANAGEMENT PLAN STUDY

RESPONSE TO THE APRIL, 1994, UPDATE NEWSLETTER

OPTIONS						
OPTION I	OPTION II	OPTION III	OPTION IV	OPTION V	OPTION VI	OPTION VII
			X	X		
X	X	X	X	X	X	X
X	X		X	X	X	
				X		
				X		
						X
				X		
			X			
				X	X	
				X		
				X		
				X		
2	2	1	4	10	3	2

Note: We received fourteen responses back; some checked more than one option; two of them did not indicate any preferred option; one checked off all the options.

COMMENTS RECEIVED:

- Mark - really hard to cross reference because labelling is inconsistent. Bar graphs + simulations should also be labelled OPT I to VII not just OPTHYD etc... so that one can choose option from those pages as well. Did you keep Lake Nip. cottage preferred levels still at 260.0 m? It seems the lake exceeds that level many times still though I didn't count to see if actual #s were correct. Options IV or V most acceptable but not really desirable for cottage owners - still limit over 400+ weeks!

- I love Lake Nipigon and don't want anything put in or on Lake Nipigon that will destroy the lake and harm the fish.

- Options are a bit unclear - for example, if Option III is the best for Ontario Hydro, and involves maintaining max. flow at 390 m/s, why is there now a problem with low flow on the river? And how costs for options?

- Why are our Hydro rates so high, 3 big power plants within 30 miles? Water power is supposed to be cheaper.

- Hopefully this will come to a peaceful settlement soon.

- Lake Nipigon is the most pristine of the study area, and should be preserved. I believe that controlling the winter draw down would help restore the lake to a world class brook trout fishery. The fishery has more value than the power loss which can be replaced by nuclear or some other means, if it is required at all.

- As a Canadian, want no industrial or utility interests, involving waters entering Lake Nipigon, any action by man that would have detrimental effects on the water quality or fisheries.

- We feel the Lake (Nipigon) being a much larger body of water than the Nipigon river deserves equal, if not greater consideration in your effort. We fear your survey will result in greater-concern for the river because it is more accessible to the larger population of the north. The lake has very few access points and is dangerous for distant travel with small craft. However, the lake and its resources are very important to present and future generation.

- [indicated Option V as preferred] Also like lake levels (Lake Nipigon) as indicated in Option 2 for docks & island property.

- Seems like the only option [V]. Everybody wins to some degree! Lets do it!

Appendix C

- Press Release (May 30, 1994)
  Faxed to: Nipigon - Red Rock Gazette
  Thunder Bay Chronicle Journal/Times News
  Thunder Bay TV News
  CJLB Radio Thunder Bay
  CBQ Radio Thunder Bay

- Working Group Notice of Meeting (April 26, 1994)

- Advertisement of Final Working Group Meeting
  Appeared in: Nipigon - Red Rock Gazette (June 7, 1994)
  Thunder Bay Chronicle Journal (June 6, 1994)

TO: Nipigon and area media

FROM: Mark Kolberg, Project Manager

DATE: May 30, 1994

* * * FOR IMMEDIATE RELEASE * * *

Working Towards Improving Water Level Fluctuations on Lake Nipigon and the Nipigon River

The *Options Report for the Development of a Water Management Plan for the Nipigon River* was released at the end of April, 1994. The *Options Report* presents seven different options or choices for managing the water levels on Lake Nipigon and the Nipigon River, including Lake Helen and Polly Lake. It outlines the continuing public consultation process and describes how the interests of the various stakeholders have been taken into consideration. The stakeholders are concerned with fish on Lake Nipigon, brook trout and other fish on the lower Nipigon River, hydroelectric power generation, shoreline erosion and property damage on Lake Nipigon, Lake Helen and Polly Lake, boating and the water supply taken from the Nipigon River. A newsletter summarizing the *Options Report* was sent to everyone on the Study Team's mailing list.

A community-based committee, called the Working Group, has met regularly with the Study Team since June of 1993. The last Working Group meeting is scheduled for Thursday, June 9, 1994, from 7:00 to 9:00 p.m. at the Royal Canadian Legion Hall in Nipigon. The Working Group will discuss the outcome of the public consultation. It is anticipated that they will be in a position to decide on a preferred option for recommendation to the Study Team. The meeting is open and everyone is welcome to attend and provide comments.

The *Options Report* is the second in a series of reports which document the development of a water management plan for the Nipigon River system. This project was initiated by the Nipigon River Management Committee, which includes representatives from the Ontario Ministries of Natural Resources and Environment and Energy, Ontario Hydro, the Nipigon Bay Remedial Action Plan team, the Nipigon Bay Remedial Action Plan Public Advisory Committee, Environment Canada and Fisheries and Oceans Canada.

The overall goal of the study "is to establish, through public involvement, a management option that will reduce the impacts of the operation of Ontario Hydro's Nipigon River hydroelectric dams on the Lake Nipigon/Nipigon River watershed, particularly on the Nipigon River fishery. This management option for the Nipigon River must not further aggravate the impacts of fluctuating water levels on Lake Nipigon."

It is the Study Team's understanding that the stakeholders hope to use the results of this study and public consultation exercise to reach a long-term agreement for the management of the water quantity in the Nipigon system.

This two-year study is being conducted by the Study Team headed by Atria Engineering Hydraulics Inc. Atria Engineering has been assisted by David Evans, community affairs consultant, Ecological Services for Planning Limited, Alan A. Smith Inc., E. Soulis, K. Ponnambalam, and MWR and Associates.

The first report, *Nipigon River - Development of a Water Management Plan, Draft Options Report*, was released to the public in May, 1993. The report summarized issues identified by individuals and groups, interviewed by members of the Study Team, who had concerns about the effects of water level fluctuations on the Nipigon system. The report was discussed at public meetings held in Nipigon, Thunder Bay and Beardmore in June 1993.

The *Options Report* makes no recommendations - they are still to come. The Study Team will review the comments it receives during this phase of the consultation and then, based on the technical work it has conducted during the past two years, the stakeholder comments it has received, and input from the Working Group, the Study Team, in its *Final Report*, will make a recommendation proposing its preferred management option.

Anyone interested in receiving a copy of the newsletter summary of the *Options Report* should contact Mark Kolberg, Study Team project manager (Atria Engineering Hydraulics Inc., 8 Stavebank Road, N., Suite 401, Mississauga, Ontario, L5G 2T4, telephone 905-891-0020) or the Lake Superior Programs office (1194 Dawson Road, Thunder Bay, Ontario, P7B 5E3, telephone 807-768-1826).

* * * *

For further information contact Mark Kolberg, 905-891-0020.

April 26, 1994

NOTICE OF MEETING

NIPIGON RIVER

WATER QUANTITY MANAGEMENT WORKING GROUP

PLEASE BE ADVISED THAT THE LAST MEETING OF THE WORKING GROUP WILL TAKE PLACE ON

DATE: **THURSDAY, JUNE 9, 1994**

TIME: **7:00 to 9:00 p.m.**

PLACE: **NIPIGON LEGION HALL.**

WE INTEND TO DISCUSS THE OUTCOME OF THE PUBLIC CONSULTATION. ALSO, IT IS ANTICIPATED THAT THE WORKING GROUP WILL BE IN A POSITION TO DECIDE ON A PREFERRED OPTION FOR RECOMMENDATION TO THE STUDY TEAM.

IF YOU HAVE ANY QUESTIONS, PLEASE CALL MARK KOLBERG, PROJECT MANAGER, AT ATRIA ENGINEERING (TELEPHONE 905-891-0020).

Atria

Managing Water Level Fluctuations on Lake Nipigon and the Nipigon River

A Study Team, hired by the Nipigon River Management Committee, released the ***Options Report for the Development of a Water Management Plan for the Nipigon River*** at the end of April, 1994. The *Options Report* presents seven different options or choices for managing water levels on Lake Nipigon and the Nipigon River, including Lake Helen and Polly Lake.

The Working Group, a community-based committee, has been meeting regularly with the Study Team since June, 1993.

You are invited to attend the next meeting to provide comments on the proposed options

Thursday, June 9, 1994
7:00-9:00 pm
Royal Canadian Legion Hall
102 5th St.
Nipigon, Ontario

The Working Group will discuss the outcome of the public consultation and a preferred option will be selected at this time

For more information please call Mark Kolberg collect at Atria Engineering Hydraulics Inc. (905-891-0020) or the Lake Superior Programs Office in Thunder Bay (807-768-2100)

RAP

NORTH SHORE
OF LAKE SUPERIOR
REMEDIAL ACTION PLANS

Appendix D

June 3, 1994, Letter from Rocky Bay Fisheries Unit to Atria Engineering

June 3, 1994

Atria Engineering Hydraulics Inc.
8 Stavebank Road North, Suite 401
Mississauga, Ontario
L5G 2T4
Attn: Mark Kolberg

Dear Mark:

Sorry for the delay in the comments on the RAP report on the Nipigon River but we have been busy in the field and the May 31 deadline got by us.

After reviewing the document, and realizing that everyone must compromise to some extent, we recommend that, **until the studies being undertaken by the Rocky Bay Fisheries Unit are completed and analyzed,** that OPTION 5 by adapted as an interim measure. This decision is based mainly on a reduction in the fluctuations of the lake and an anticipated benefit to the lake fish. We would hope that further refinement of these options can and will be made following the completion of our research and that other research will be performed within the lake which can add to and compliment our own.

Thank you for the time to comment on the options report.

Sincerely,

Harold Michon
Manager
Rocky Bay Fisheries Unit

Sam A. Stepehenson
Biologist
Rocky Bay Fisheries Unit

ERRATA

Draft Options Report, May 1993
Options Report, April 1994

ERRATA - *DRAFT OPTIONS REPORT*

1) FORWARD, para. 1, line 2 - should read "...the Nipigon Bay RAP Public Advisory Committee..."

2) ACKNOWLEDGEMENTS - should read "Bill Hudson"

3) ACKNOWLEDGEMENTS and TABLE OF CONTENTS; page header - should read "Development of a Water Management Plan"

4) List of Photographs, Photo 3.3.7c - should read "Damaged boat dock at Macdiarmid, Lake Nipigon, October, 1992 (recorded water level 260.23 m to 260.43 m)

5) page 1, Section 1.1, para. 3, line 1 - should read "...established by the late 1880's..."

6) page 6, Section 2.1.1, para. 3, line 4 - should read "...development now consists of a series of three dams (from north to south)..." and the last sentence should read "A forth dam, the Virgin Falls control dam, first constructed in 1926..."

7) page 14, para. 3 - the last sentence should be moved to follow the first sentence

8) page 22, para. 2, sentence 2 - should read "The general principle for..."

9) page 30, para. 1, line 2 - should read "...to be not all that prevalent."

10) page 33, para. 2, sentence 2 - should read "The first redd becomes exposed at about 250 m^3/s."

11) page 62, Photo 3.3.7c - label should read "Damaged, October 1992 (recorded water level 260.23 m to 260.43 m)"

12) page 67, para. 4, starting with sentence 3 - should read "The Nipigon system would be unable to meet the demand for additional electricity and Hydro would have to rely on more costly means of production.

"The value of peaking in hydro-electric generation depends on the marginal costs. The term..."

13) page 70, para. 4 - should read "In 1993, Ontario Hydro adopted a different restriction on the peaking decrease. The initial reduction is 100 m^3/s with a further 50 m^3/s every 2 hours.

14) page 71, Table 4.3.2 and page 72, para. 4 - The estimated value of the replacement cost should have been $450,000 due to the additional off-peak production. This is described in more detail in the *Options Report* (page 57, last paragraph).

15) page 84, Photos 4.5.3 and 4.5.4 - In the first printing of the *Draft Options Report*, the photo labels were interchanged. Subsequent versions were corrected. The correct positions are: top of page, Photo 4.5.4 "...crayfish..."; and bottom of page, Photo 4.5.3 "...sculpins..."

16) page 93, para. 4, line 6 - should read "...that a minimum water flow of 250 m^3/s should be maintained...".

17) page 94, para. 3, line 2 - should read "...river elevation is 183.21 m. The water level at 350 m^3/s is approximately 183.96 m (see Figure 2.1.3)."

18) page 96, para. 3, line 3 - should read "...They see lake levels and river flows as part..."

19) page 114, Table 5.1
- Option B BENEFITS should start with "Compared to A:"
- Option B COSTS should start with "Compared to A:"
- Option C BENEFITS should start with "Compared to B:"
- Option C COSTS should start with "Compared to B:"

ERRATA - *OPTIONS REPORT*

1) FORWARD, para. 1, line 2 - should read "...the Nipigon Bay RAP Public Advisory Committee..."

2) page iv, Table - in Comments column, the term "...value..." should read "...average annual value..." at all three locations

3) SUMMARY, page v, point 6 - should read "...varies from $26.93 million to $30.86 million..."

4) ACKNOWLEDGEMENTS - should read "Gord Laird, Area Supervisor, Lake Nipigon West Area..."

5) page 1, Section 1.1, para. 1, line 5 - should read "...the Nipigon Bay Remedial Action Plan..."

6) page 37, Section 3.5.2, para. 4, line 5 - should read "...seen in Figure 3.11. Figure 3.11 includes, but does not identify, the effects of Lake Superior water levels. The level of Lake Helen is influenced by the level of Lake Superior (see Appendix 2B.2 of the *Draft Options Report*). The model can now be..."

7) page 58, Table 4.2 - in Comments column, the term "...value..." should read "...average annual value..." at all three locations

8) page 65, point 2 - should read "...varies from $26.93 million to $30.86 million..."

9) Appendix E - the following should be added to the end of Appendix E

"In this study, the cost $c^t(s^{t-1}, s^t)$ is determined from weighted penalty costs as described in Chapter 3, Section 2 of this report. This cost depends on the Lake Nipigon storage level and the release from the lake and is a function of the week number.

"References:

Ponnambalam, K. 1987. Optimization of the Integrated Operation of Multi-reservoir Irrigation Systems. Ph.D. Dissertation, University of Toronto.

Remedial Action Plan
Plan d'Assainissement

Canada Ontario

Canada-Ontario Agreement Respecting Great Lakes Water Quality
L'Accord Canada-Ontario relatif à la qualité de l'eau dans les Grand Lacs